APPENDIX E

Alternatives Analysis, Section 5 of Draft EIR

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5: ALTERNATIVES TO THE PROJECT

5.1 Introduction

5.1.1 CEQA REQUIREMENTS

Section 15126.6 of CEQA requires that an EIR describe a range of reasonable alternatives to the project that would feasibly attain the basic project objectives and avoid or substantially lessen any significant effects of the project. Alternatives may be eliminated from detailed analysis in the EIR if they fail to meet the most basic of project objectives, are determined to be infeasible, or cannot be demonstrated to avoid or lessen significant environmental impacts.

5.1.2 PROJECT OBJECTIVE

The Coso Operating Company, LLC (COC) is seeking a 30-year Conditional Use Permit (CUP No. 2007-03) from the Inyo County Planning Commission for the Coso Hay Ranch Water Extraction and Delivery System project.

The proposed project includes extracting groundwater from two existing wells on the Coso Hay Ranch, LLC property (Hay Ranch) in Rose Valley and delivering the water to the injection distribution system at the Coso geothermal field in the northwest area of the China Lake Naval Air Weapons Station (CLNAWS).

The objective of the proposed project is to provide supplemental injection water to the Coso geothermal field to minimize the annual decline in reservoir productivity due to evaporation of geothermal fluids from power plant cooling towers. The project objective is to sustain the production capacity and useful economic lives of the existing power plant units.

5.2 Alternatives Considered but Rejected

5.2.1 OVERVIEW

Section 15126.6(c) of the CEQA Guidelines permits the elimination of an alternative from detailed consideration due to:

- Failure to meet most of the basic project objectives
- Infeasibility
- Inability to avoid significant environmental impacts

Section 15126(f)(1) of the CEQA Guidelines states that “Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries…and whether the proponent can reasonably acquire control or otherwise have access to the alternative site. No one of these factors establishes a fixed limit on the scope of reasonable alternatives.”

Alternatives such as evaluating different geothermal technologies or electricity generation facilities do not meet the project’s basic objective of maximizing utilization of the generating capacity of the existing plants. These sorts of alternatives are uneconomical and result in stranded investment costs from decommissioning existing operational facilities. These options may also have new environmental impacts from construction, regulatory limitations, issues with available infrastructure, etc.

Alternatives such as intentionally reducing electrical generation at the Coso geothermal plants do not meet the basic project objective of maximizing utilization of the generating capacity of the existing plants and would conflict with the applicant’s obligations under existing power purchase agreements. Therefore, any alternatives associated with using different technology for electricity generation or for intentionally reducing power generation at the plants were rejected for failure to meet the most basic of project objectives, lack of economic viability, and regulatory limitations in terms of violating existing power purchase agreements.

Other alternatives considered but rejected include increasing power generation through power plant enhancements and providing water through an alternative source. These alternatives and reasons for rejection are described in greater detail in the following sections.

5.2.2 INCREASE POWER GENERATION THROUGH POWER PLANT ENHANCEMENTS

Introduction

One alternative considered was the potential for increasing power generation output through power plant enhancements. This alternative has the potential to achieve the project objective of increased power generation. The feasibility of improved power generation was investigated by comparing possible increased output from various potential plant efficiency improvements to the cost of the improvements for improved power generation and to the cost from projected decrease in steam production declines related to the project.

The incremental additional power generation output associated with the project based on reservoir projections was provided by COC. The projections are based on a reservoir simulation performed by COC. Reservoir projections include the projected total mass flow produced to the power plants, the total mass injected, and the enthalpy (thermodynamic potential or heat content) of fluid produced to the power plants without the project and with the project.

The analysis was based on production rates and enthalpies forecast through 2035 for the Coso geothermal projects, with and without additional injection. The approximate additional output associated with the additional flow rates and associated different enthalpy during the period was calculated (Global Power Solutions 2008) based on these forecasts. This amount of additional output relative to the total project price of $13.4 million produces an average of nearly 18 MW (see

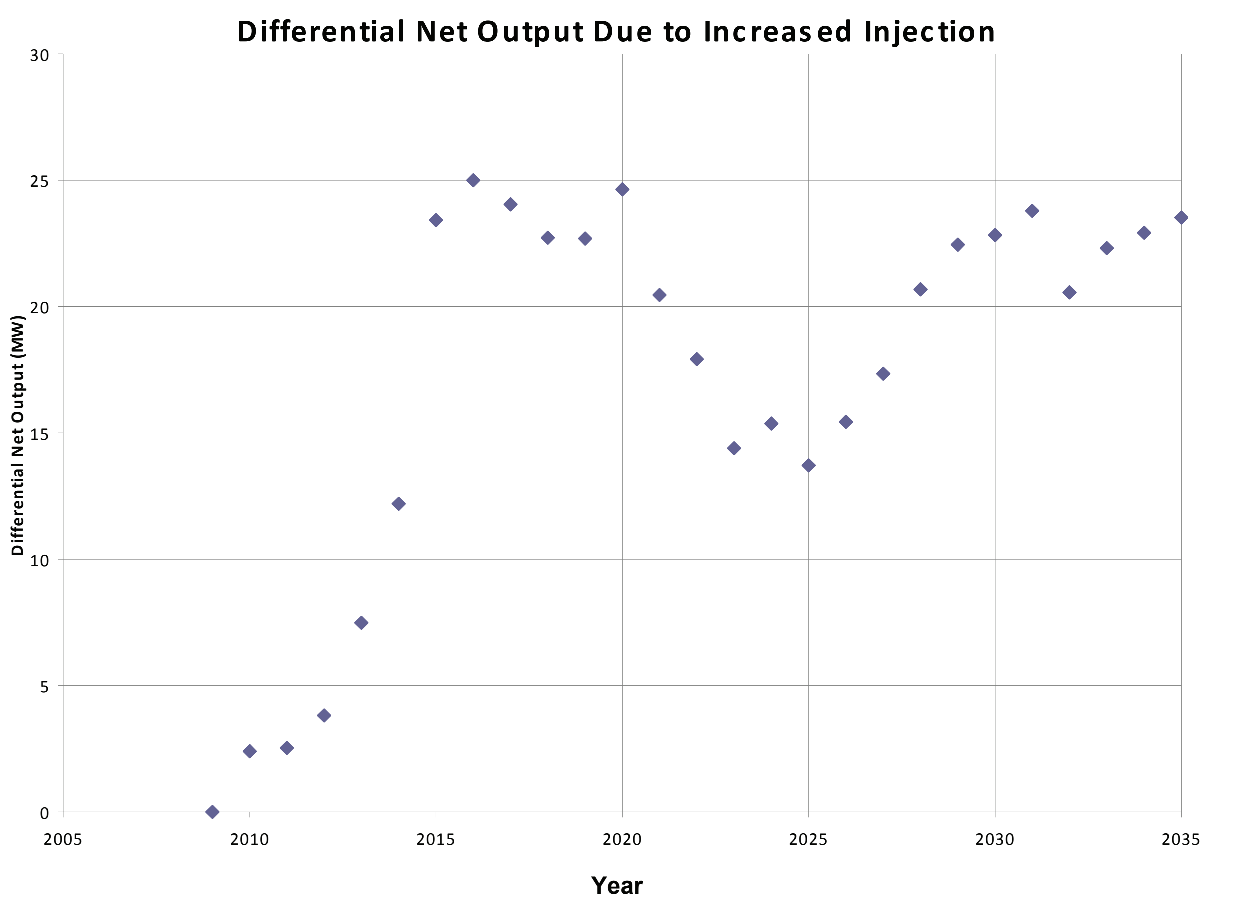
Figure 5.2-1 below) of additional output, or a cost of less than $750/kW. All other possible power generation improvements were then compared to this value.

Overall Objective

COC seeks to offset a substantial decline in the geothermal field's productivity, and the consequential reduction in power output. Early in the history of geothermal development at the Coso geothermal field, generation was approximately 270 MW. Output is now under 200 MW, representing a total power generation decline of more than 25 percent. The total mass fluid produced has declined from 15,000 kilograms per hour (kph) to approximately 9,000 kph, representing a decline of approximately 40 percent. The power generation has declined at a lower rate than the reservoir production partly because the enthalpy of the fluid has increased, but primarily because COC has already performed numerous modifications to the power generation facilities in order to increase power generation efficiency.

Most plant modifications, at best, yield benefits on the order of 5 percent and most of these have already been undertaken by COC. With the diminishing returns associated with progressively smaller modifications, plant modifications tend to become less and less economical. A combination of many smaller modifications cannot provide the magnitude of increase in productivity sought by implementing the proposed project. Plant modifications were therefore considered but rejected as part of the alternatives analysis. Additional detail on these modifications is presented below.

Figure 5.2-1: Differential Net Output Due to Increased Injection Through 2035



Previous Power Plant Modifications

COC has undertaken a series of plant modification projects over the past 20 years. These included:

- Steam gathering system modifications to reduce pressure losses
- Upgrades to the gas removal and gas treatment systems
- Turbine upgrades through reblading to improve the match between declining inlet pressure (as a result of reducing reservoir pressure) and turbine design
- Relocation of injection to optimize heat mining

Additionally, COC drilled more than 100 production and injection wells, effectively saturating the reservoir development with minimal well spacing.

Contemplated Power Plant Modifications

Overview

COC has considered several power plant modifications that were ultimately rejected due to poor economic returns. Three classes of contemplated modifications have been investigated:

1) Modifications providing additional output without utilizing more resource or system efficiency improvements
2) Modifications providing water savings through a reduction in the evaporative water losses associated with the cooling towers
3) Other sources of water for injection

Based on experience at other geothermal and non-geothermal power projects, this list appears to include all reasonable power plant modifications.

COC's System Efficiency Improvements

Most of COC's modifications to date are modifications providing additional output without utilizing more resource or system efficiency improvements. COC anticipates a continuing program of upgrades to the gas removal systems and turbine reblading to maintain the match between design inlet pressures and the reduction of reservoir pressures. These upgrades will provide benefits irrespective of augmented injection. These upgrades will be undertaken when it is economical to do so and are therefore complimentary. These improvements, however, do not match the magnitude of benefits associated with augmented injection as specified in the project objectives.

There are no known improvements that would provide a total of 18 MW of average power increase at or below $1,500/kW, twice the cost of the project. All conceivable options considered complimentary and in aggregate (combined with the project) would not bring output at Coso up to its original design output.

Examples of efficiency improvement options considered and their costs are shown in Table 5.2-1.

Water Savings Modifications

COC evaluated substitution of some or all "dry cooling" for the evaporative losses of their current wet cooling systems. These modifications are very capital intensive and result in a loss of net generated power for their water savings. The water savings, if reinjected, would not offset the power loss.

Table 5.2-1: Examples of Power Plant Efficiency Improvements		
Modification	**Improvement**	**Cost**
Complete turbine replacement	~3% (1 MW/unit)	$10-15 million/unit
Binary bottoming cycle	Marginal, silica scaling potential	$1,500/kW
Noncondensable gas systems	< 1 MW/unit (4 unit potential)	Minimal
Gas precoolers	< 1 MW (6 unit potential)	$1 million/unit

Summary

None of the system efficiency alternatives are competitive with the proposed water augmentation project. Efficiency alternatives appearing to be economical in the future, including upgrades to the gas removal systems and turbine reblading, are complementary to the proposed action but would not meet the project objectives by themselves. None appear to enhance the benefit provided by injection in any material way, but may be affected in timing (as to when they become cost effective) by injection.

5.2.3 ALTERNATIVE SOURCES OF INJECTION WATER

A second alternative to the project involves obtaining water for injection from a source other than at Hay Ranch. Several alternative sources of water were identified and considered by COC as sources of injection water. These alternatives are compared with the potential productivity of the Hay Ranch wells in Rose Valley, which is approximately 3,000 gpm on average. The cost for water extraction and transfer from the Hay Ranch location is approximately $13.4 million. The cost of water delivery to the injection system would include well drilling costs, pipeline construction, pumping requirements, and environmental costs. Approximately $7.4 million is fixed, and $6 million is specifically related to the 9-mile pipeline and pumps for the Hay Ranch wells. The fixed costs include enhancement of injection systems, engineering, and permitting that would be required regardless of the location of the water, although the costs might be somewhat less for smaller amounts of water. Any alternative source of water would have to produce a significant amount of water to be economically feasible.

Possible alternative sources identified by COC (Arruda pers. comm. 2007) include:

- Groundwater wells on CLNAWS typically drilled as exploration wells
- Groundwater wells in the Coso Basin
- Marginal geothermal wells in the Coso Range

The alternative sources of water are summarized below in Table 5.2-2.

COC estimated that a water source would have to produce at least 500 gpm to be economically feasible as an injection water source. The rate is reasonable considering the fixed costs for a water extraction project are probably on the order of $7 million. None of the other considered water sources come near to those potential rates except possibly the marginal geothermal wells. The project benefit in reduction in the rate of decline of steam delivered to the power plants is based on a reduction in the current negative net mass withdrawal. Extraction of fluid from geothermal wells that are closely connected to the reservoir would not provide the reduction in net mass withdrawal that the project requires for the anticipated benefit.

The review of potential production wells does not identify any other water sources that come near to the potential to supply injection water as the Hay Ranch project at 3,000 gpm, or the minimum economically feasible amount of 500 gpm, except possibly the Coso Ranch wells. Average well

Table 5.2-2: Potential Alternative Sources of Water for Injection

Well	Location	Type	Potential Productivity (gpm)	Comments
OB1	T22SR39E Sec16	Coso Basin groundwater	<50 gpm	Potential low, based on proximity to OB2
OB2	T22SR39E Sec16	Coso Basin groundwater	<50 gpm	Pump test performed, well capable of low rate
LEGO	T22SR38E Sec16	Navy exploration well	<25 gpm	Pump test performed, well capable of low rate
G-36	T22SR38E Sec17	Navy exploration well	<25 gpm	Potential low based on location near to LEGO and surface geology
73-21	T22SR39E Sec21	Marginal geothermal well	NA	Pressure and Temp indicate well connected to Reservoir
48-11	T22SR38E Sec11	Marginal geothermal well	NA	Pressure and Temp indicate well connected to Reservoir, low permeability
CGEH	T22SR39E Sec6	Navy exploration well	<100 gpm (est.)	Low permeability in open hole section, pressure data suggests well connected to Reservoir
18-28	T22SR38E Sec28	Navy exploration well	<150 gpm (est.)	Navy test well, flow estimate based on driller information.
Coso Ranch	N/A	Rose Valley water well	N/A	Requires pipeline construction underneath a major highway. Environmental impacts more adverse than existing Hay Ranch project based on location within the valley and disturbance from the road crossing. Water would be withdrawn from the Rose Valley, similar to the proposed project. Impacts to groundwater in Rose Valley would be similar.

flow rates in the Coso Basin area are low, so it is unlikely that new wells drilled in that area would produce water at economically feasible rates.

Although the Coso Ranch wells may produce sufficient volume, the location of these wells is such that the environmental impacts (related to hydrological impacts and surface disturbance of crossing a major highway) would exceed those of the proposed project. Therefore, development of alternative sources of water does not appear to be a viable alternative to water extraction at Hay Ranch.

5.2.4 REDUCING THE TIMEFRAME OF THE CUP

Shortening the length of the Conditional Use Permit (CUP) for the proposed project was considered but rejected. Initial reasoning for shortening the length of the CUP was to link the permit to the most conservative timeframe for when the surface waters of Little Lake would not be adversely affected by groundwater drawdown. The groundwater impact modeling showed that groundwater drawdown without mitigation could impact Little Lake in fewer than 10 years. It is not possible to define a shortened timeframe that would still prove economical and practical compared with the price of the project construction.

5.3 No Project Alternative

Section 15126.6(e) of the CEQA Guidelines requires consideration of the environmental consequences if the project is not constructed. The No Project Alternative would result in no injection of supplemental waters to the Coso Geothermal Field. The No Project Alternative would avoid any direct impacts associated with the proposed project.

The No Project Alternative would result in a shortened lifespan of the Coso geothermal projects. The Coso Hot Springs could return to a natural state sooner if the power plants and geothermal withdrawal were to cease. Other impacts associated with the plants would also cease sooner than planned (e.g. air emissions, traffic issues, etc.). If the lives of the geothermal projects are shortened, however, there would be a decrease in power supply, which would impact regional utilities or could require construction of new facilities that could have other environmental effects. The loss of the geothermal projects would also reduce royalty revenue to the federal government and Inyo County, and property tax revenue to Inyo County.

The No Project Alternative avoids potentially significant and mitigable environmental impacts identified in Section 3 Environmental Impact Analyses; however, it would not meet the project objectives of providing supplemental injection water to the Coso geothermal field to minimize the annual decline in reservoir productivity.

5.4 Considered Action Alternatives

5.4.1. ALTERNATIVE 1: PUMPING HAY RANCH WELLS AT THE MAXIMUM RATE SUSTAINABLE FOR THE 30 YEAR PROJECT LIFE WITHOUT REACHING TRIGGER LEVELS

Overview of Alternative

This alternative includes pumping of the Hay Ranch wells at estimated minimum rates that can be sustained for the entire 30 year project life without exceeding the hydrologic trigger levels identified for Little Lake Ranch. In order to not exceed hydrologic trigger levels, project pumping shall not:

- Reduce groundwater flow into Little Lake by more than 10%
- Decrease groundwater levels at the northern end of Little Lake by more than 0.3 feet

Because drawdown predicted by the numerical groundwater flow model discussed in Appendix C2 is sensitive to aquifer specific yield, which could not be determined during the preparation of the EIR, analyses were conducted to evaluate the minimum sustainable pumping rates for assumed specific yield values of 10%, 20%, and 30%.

Environmental Effects of Alternative 1

The environmental effects of Alternative 1 would be largely the same in nature as the proposed action, but would take longer to occur. The alternative would reduce but not eliminate hydrological and biological effects from groundwater pumping.

The effects to Agricultural Resources, Cultural Resources, Population and Housing, Land Use, Aesthetics, Hazards and Hazardous Materials, Air Quality, Transportation and Traffic, Noise, Public Services, Population and Housing, and Land Use would be the same as for the proposed project. The following discussion identifies environmental effects of Alternative 1 that would differ from the effects identified for the proposed project. All mitigation measures identified for the proposed project would apply to Alternative 1 and be included in the alternative project.

Hydrology and Water Quality. This project development alternative was evaluated by constructing groundwater model scenarios in which the calibrated model parameter set and boundary conditions were held fixed with one exception: specific yield was varied from a low of 10% to the estimated average value of 20%, and to a high of 30%. Trigger levels in groundwater wells throughout the valley for the reduced pumping rate alternative would be the same as for the proposed project (Table 3.2-7); however, the elapsed time expected without exceeding a trigger level would be extended further into the future, due to the lower pumping rate.

Simulations were conducted for each of the three specific yield values to evaluate the pumping rate associated with each specific yield value that could be sustained for the entire 30 year project life without exceeding hydrologic trigger levels near Little Lake. The results of these model simulations indicated that lower pumping rates can be sustained when a low specific yield (10%) is assumed for the aquifer; higher pumping rates can be sustained when a high specific yield (30%) is assumed for the aquifer. Drawdown takes longer to develop farther from Hay Ranch (as discussed in section 3.2 Hydrology and Water Quality). The maximum groundwater table drawdown predicted to develop near Little Lake occurs years after the end of the 30 year project. For this reason, the simulation scenarios were extended to simulate groundwater conditions up to 150 years after project startup.

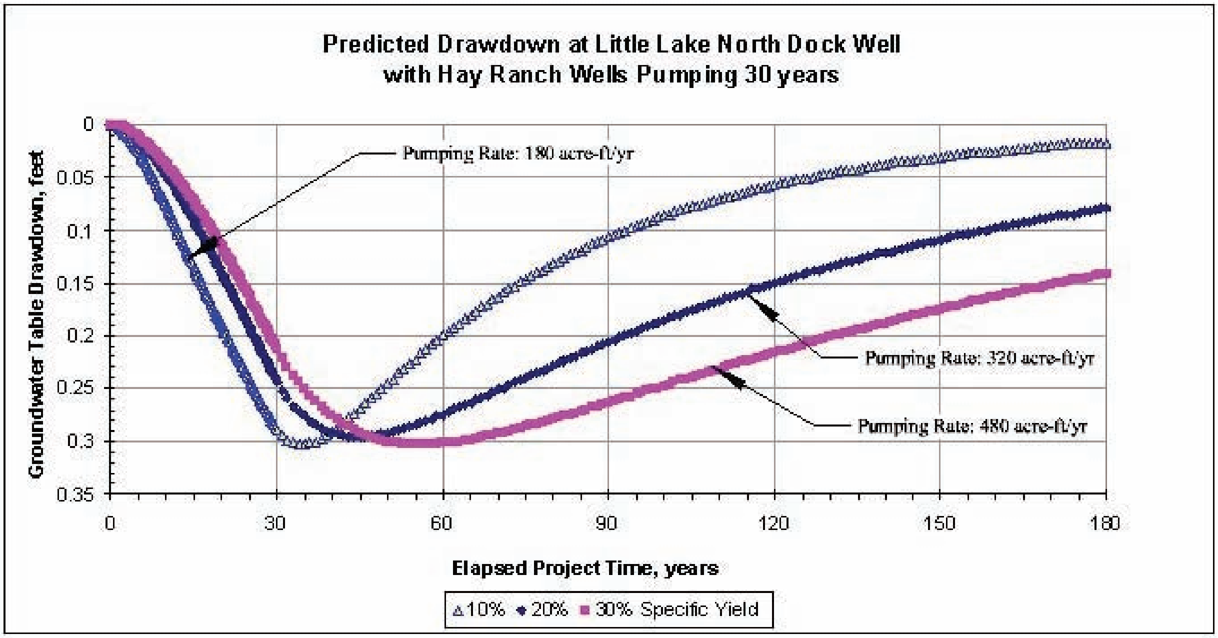
The effects of pumping at Hay Ranch for the three specific yield values on the estimated maximum pumping rate that can be sustained for the entire 30 year project life, and not exceed the hydrologic trigger levels identified for Little Lake Ranch, are shown in Figure 5.4-1. The predicted sustainable pumping rates range from approximately 180 acre-ft/yr, assuming a low specific yield of 10%, to 480 acre-ft/yr year, assuming a high specific yield of 30%. As depicted in Figure 5.4-1, the time at which the maximum drawdown is predicted to develop at Little Lake is approximately 35 years from project commencement for 10% specific yield to nearly 55 years for 30% specific yield. The groundwater table begins to rise back to predevelopment conditions after pumping is stopped at Hay Ranch; but, there is a lag time until the water levels begin to rise the farther the distance from Hay Ranch.

The model indicates that drawdown at the south end of Little Lake Ranch would be less than at the north end. Groundwater levels at the north end of the lake are the more sensitive indicators of potential impacts. The modeling analysis predicts that pumping for 30 years at the lower rates identified above (180 to 480 acre-ft/yr depending on specific yield) would not exceed the trigger levels; however, if it did, the same mitigation as prescribed for the proposed project (Hydrology-1, Hydrology-2, Hydrology-3, and Hydrology-4) would be implemented.

Geology, Soils, and Seismicity. The effects to geology and soils from Alternative 1 would be similar to those of the proposed project, with the exception that the potential for subsidence in the Rose Valley would be reduced. Subsidence would be reduced because the lower pumping rates would create less groundwater table drawdown, reducing the effects of dewatering on potentially compressible soils.

The potential for ground subsidence from the proposed project would be less than significant because of the highly consolidated nature of the soils (refer to Section 3.3 Geology and Soils). Potential for subsidence from Alternative 1 would also be considered less than significant, as pumping rates would be lower than the proposed project.

Figure 5.4-1: Hay Ranch Pumping Rates That Can be Sustained for 30 Year Project Life



Biological Resources. Effects of project construction, operation and maintenance, and decommissioning under Alternative 1 would be similar to the proposed project, except with respect to indirect impacts to water dependent vegetation at Little Lake as they pertain to impacts to the water discharge level at Little Lake. Alternative 1 would likely maintain adequate water availability at Little Lake (no greater than 10% reduction in flow into the lake and ponds). There may also be some reduction in groundwater elevation near Little Lake; however, the predicted amount of drawdown ranges from less than to only slightly greater than natural groundwater table fluctuations observed in the area. Existing plant communities are likely already adapted to groundwater table decreases of this magnitude and would not likely be impacted significantly.

Monitoring and mitigation would be the same as for the proposed project, as would trigger levels and mitigation. If the hydrologic trigger levels were reached, mitigation that requires scaling back pumping (or turning off pumping as is the case in this alternative) would be implemented.

5.4.2 ALTERNATIVE 2: PUMPING HAY RANCH WELLS AT LOWER RATES

Overview of Alternative

Several alternatives to the full project development were evaluated and consisted of pumping the Hay Ranch wells at rates and pumping durations less than the full development rate of 4,839 acre-ft/yr. Project development alternatives were evaluated by constructing groundwater model scenarios in which the calibrated model parameter set and boundary conditions were held fixed. Specific yield was set to a conservatively low value of 10 percent for these analyses. Three scenarios corresponding to Hay Ranch extraction rates of 750, 1,500, and 3,000, acre-ft/yr were conducted. The results of these modeled scenarios were evaluated in terms of the predicted impact to groundwater elevations at Little Lake and the groundwater flow rate available for discharge to Little Lake.

Environmental Effects of Alternative 2

The environmental effects of Alternative 2 would be largely the same as the proposed action and Alternative 1. The alternative would reduce, but not eliminate, hydrological and biological effects from groundwater pumping. Alternative 2 would reduce any potential for subsidence in Rose Valley due to groundwater pumping.

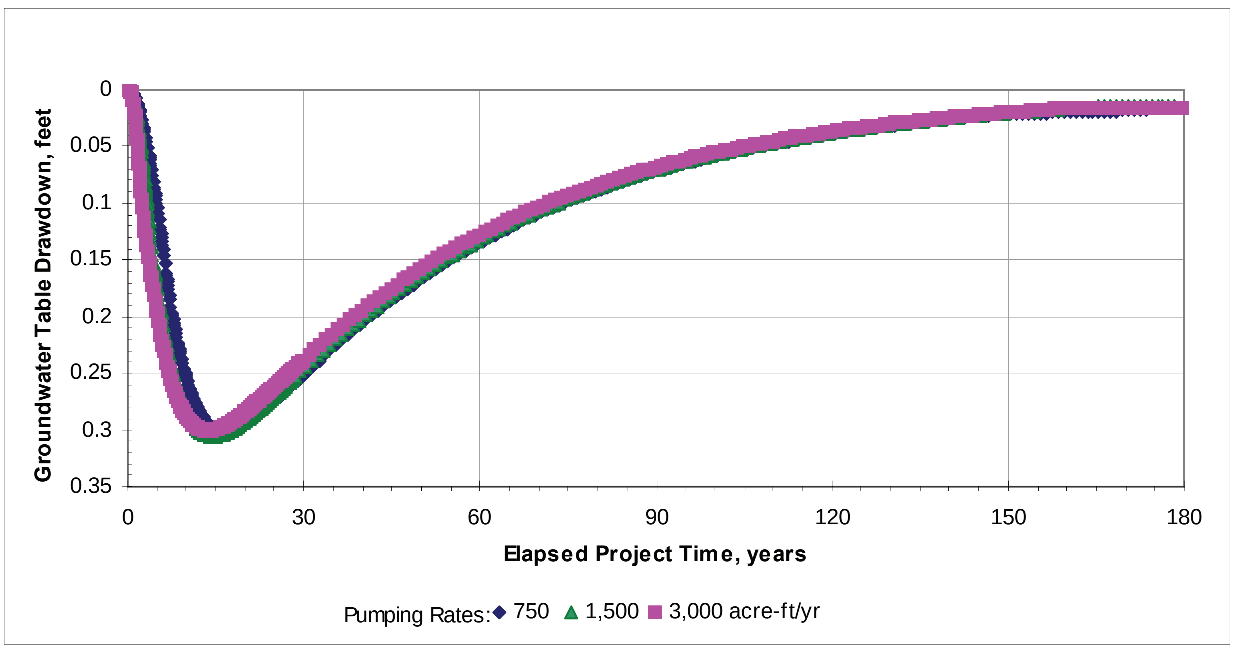
The effects to Agricultural Resources, Cultural Resources, Population and Housing, Land Use, Aesthetics, Hazards and Hazardous Materials, Air Quality, Transportation and Traffic, Noise, Public Services, Population and Housing, and Land Use would be the same as for the proposed project. The following discussion identifies environmental effects of Alternative 2 that would differ from the effects identified for the proposed project. All mitigation measures identified for the proposed project would apply to Alternative 2 and be included in the alternative project.

Hydrology and Water Quality. The effect of alternative project pumping rates at Hay Ranch on the predicted groundwater table drawdown at the north end of Little Lake is shown on Figure 5.4-2, assuming a specific yield of 10%. To avoid causing a greater than 10% reduction in flows into Little Lake, the duration of pumping was found to vary depending on pumping rate.

Based on these analyses, pumping at a rate of 750 acre-ft/yr could be sustained for at least 6 years without exceeding the drawdown trigger levels, pumping at a rate of 1,500 acre-ft/yr could be sustained for just over 3 years without exceeding the trigger levels, and pumping at a rate of 3,000 acre-ft/yr may be sustained for approximately 1.75 years without exceeding the trigger levels throughout the valley.

In the event that post-startup monitoring and subsequent numerical model recalibration indicates less drawdown propagation than indicated by this conservative analysis, pumping may be extended for this alternative similar to the proposed project.

Figure 5.4-2: Model Predicted Drawdown at North End of Little Lake for Alternative Development Scenarios



*Predicted minimum sustainable pumping durations:

- 6 years at 750 acre-ft/yr
- 3 years at 1,500 acre-ft/yr
- 1.75 years at 3,000 acre-ft/yr

Effects to hydrology from Alternative 2 would be similar in scope but of lower magnitude than for the proposed project. Less drawdown would be induced near Little Lake. The time frame for impacts to the Little Lake area would be extended slightly (see Figure 5.4-2); that is, the predicted reduction in groundwater flow towards Little Lake would occur later in the project at reduced pumping rates. However, reduction in lake discharge rates would likely still occur even at the lowest alternative pumping rate considered. Mitigation would be similar to the proposed project in that pumping should be reevaluated after the first year and the continued duration of pumping and pumping rate should be determined based on additional information collected in the first two years of pumping. If lower rates are pumped initially, pumping may be able to continue for a longer period of time than if the full pumping rate is instituted from the start. The effects would be the same as for the proposed project.

With respect to water quality, the proposed project is not expected to adversely impact water quality. Consequently, Alternative 2 would have even less potential for adverse impacts to water quality.

Geology, Soils, and Seismicity. The effects to geology and soils from Alternative 2 would be similar to those of the proposed project, with the exception that the potential for subsidence in the Rose Valley would be reduced. Subsidence would be reduced because of a lower rate of groundwater pumping at Hay Ranch.

The potential for ground subsidence from the proposed project would be less than significant because of the highly consolidated nature of the soils (refer to Section 3.3 Geology and Soils). Potential for subsidence from Alternative 2 would also be considered less than significant, as pumping rates would be lower than the proposed project.

Biological Resources. Effects of project construction, operation and maintenance, and decommissioning under Alternative 2 would be similar to the proposed project, except with respect to indirect impacts to water dependent vegetation at Little Lake. Alternative 2 would eventually cause a reduction in groundwater supply and subsequent surface water volume at Little Lake. This drawdown of groundwater levels would affect the vegetation, as described for the proposed project. Under Alternative 2, mitigation defined for hydrologic impacts at Little Lake would still likely need to be implemented, but the time at which it would be needed would be later than under the proposed project. Monitoring and mitigation would be the same as for the proposed project, as would trigger levels and mitigation.

5.5 Environmentally Superior Alternative

Section 15126.6(e)(2) of the CEQA Guidelines stipulates that “If the environmentally superior alternative is the No Project alternative, the EIR shall also identify an environmentally superior alternative among the alternatives.”

The No Project alternative would maintain the existing groundwater conditions in Rose Valley but result in continued decline of the geothermal reservoir at the Coso geothermal field and the resultant decreases in productivity of the power plant facilities. The early decommissioning of the Coso geothermal plants would result in the need for construction of new power generation facilities elsewhere to make up for the loss of the over 200 MW of power supplied by the Coso geothermal projects. Construction of new power facilities could have associated environmental impacts related to construction and operation, the impact of which are speculative at this time due to several unknowns, such as what type of plants would be affected, and their locations. While the No Project Alternative would avoid groundwater impacts to the Rose Valley, the effects to electric supply in the region and the associated environmental effects of generating new electricity to compensate for the electricity lost from the Coso projects could be greater. The No Project Alternative would also result in a return of the Coso Hot Springs to natural conditions. The proposed project and Alternative 1 and 2 may actually return conditions sooner since additional water would be added to the reservoir reducing the steam cap (see section 3.2 Hydrology and Water Quality) upon project implementation.

The proposed project, without mitigation, would result in several potentially significant impacts. All potentially significant impacts could be mitigated to less-than-significant levels with implementation of mitigation measures outlined in this EIR. Alternative 1 would not reach groundwater drawdown trigger levels at Little Lake; however, neither would the proposed project or Alternative 2 if mitigation is implemented. These three alternatives would likely have equal environmental effects, but the timing for pumping and the length of time over which effects are felt would differ.